DOCUMENT RESUME

ED 101 513 EC 071 231

AUTHOR	Yamaguchi, Kaoru
TITLE	The Application of Operant Principles to Mentally Retarded Children. (RIEEC Research Bulletin 1).
INSTITUTION	Tokyo Gakugei Univ. (Japan). Research Inst. for the Education of Exceptional Children.
PUB DATE	Sep 72
NOTE	29p.
EDRS PRICE	MF-$0.76 HC-$1.95 PLUS POSTAGE
DESCRIPTORS	*Behavior Change; *Case Studies; *Custodial Mentally Handicapped; Exceptional Child Research; Mentally Handicapped; *Operant Conditioning; *Self Care Skills; Trainable Mentally Handicapped; Training Techniques

ABSTRACT

Presented are six case studies demonstrating the application of operant conditioning principles to teaching self-care skills and modifying deviant behavior in six moderately to profoundly retarded children 5- to 15-years-old in Japan. Included in the case histories, such as that of a moderately retarded 12-year-old who was toilet trained, are descriptions of the child's history, the training procedures, and the results of operant conditioning. (CL)

ED101513

RIEEC RESEARCH BULLETIN

RRB-1

The Application of Operant Principles to Mentally Retarded Children

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Kaoru Yamaguchi

EC 071 231

September 1972

The Research Institute for the Education of Exceptional Children

Tokyo Gakugei University

Koganei, Tokyo, Japan

APPLICATION OF OPERANT PRINCIPLES TO MENTALLY RETARDED CHILDREN

Kaoru Yamaguchi

The Research Institute for the Education of Exceptional Children

Tokyo Gakugei University

It was just five years ago that operant principles were first applied to behavior control of mentally retarded children in Japan. Since then, however, the number of researchers who are concerned with them has been increasing rapidly each year. We have been applying operant principles to retarded children in reference to the establishment of self-care abilities and the modification of deviant behavior. This presentation will briefly describe some of our studies on a case by case basis.

Case 1. Application of operant principles in toilet training

Subject

The subject was a moderately retarded twelve year old girl whose retardation was attributed to brain damage. Her problem was enuresis diurna. She failed four times a day on an average. Her parents consulted doctors and these doctors prescribed medication appropriate to their diagnosis of the case. The parents either forced her to go to the toilet periodically or punished her but these

methods were ineffective.

History

The pregnancy was normal and she weighed 3600g (7.9 pounds) at birth but she was in a condition of syncope. One hour after birth she had convulsions. She began to walk at the age of 2 years and 2 months and began to speak at the age of 4.

Medical Treatment

The frequency of her convulsions increased to 7-8 per day one week after birth. She had an EEG examination and was diagnosed as an epileptic. After this, she took medicine until she was three years old. Then she stopped taking the medication as she had had no convulsions. When she was eight years old, minor epilepsy began and she was hospitalized for 40 days. At that time both enuresis diurna and lack of bowel control began.

According to a physical examination, no physical deficiency was found and she took medication but it was ineffective.

When she was 4 years old she took a psychological examination and it was discovered that her IQ was 20 - 25. She was sent to a day care center for a week but the center refused to permit her to continue attending due to her toilet problems.

Baseline Period

The baseline period was only three days, but, from information supplied by her mother, it was clear that her frequency of enuresis diurna was about 4 per day. Her frequency of failures and toilet usage (both self and other initiated) were recorded. The results are shown in figure 1.

Reinforcement Period I

At the first interview with her mother we learned that she was very fond of cake so we decided to use cake as a reinforcer. We gave her 2 pieces of cake for both self and other initiated toilet usage immediately after her toilet usage.

Reinforcement Period II

As can be seen in figure 1, the reinforcement procedure was found ineffective. We observed her usual daily consumption of cake and concluded that cake was a completely ineffective reinforcer since her mother was always providing her with cake, fruit and so forth.

Consequently, we changed the reinforcer. Now she was given gold stars as a reinforcer and taken on excursions when she accumulated 20 stars. This procedure was still ineffective.

Reinforcement Period III

In period III we introduced a token reinforcement system. She was given two tokens for each self-initiated use of the toilet and one token for each other-initiated use of this facility. The tokens were presented to her by her mother after each successful usage. Failures were ignored during this period.

She accumulated the tokens in a small purse which she hung around her neck and removed at bedtime. She was able to exchange the tokens as follows :

1 token - receive nothing

2 tokens - receive cake or fruit

3 tokens - receive Coca Cola, Orange drink or the like

In addition to this, she was not able to obtain cake, fruit or soft drinks unless

she presented the tokens. If she requested any of these items and did not present the tokens, the mother consistently refused to give her any. This occasionally brought about crying and a general display of frustration but this behavior was ignored.

Table 1 Frequency of failures and toilet usage (per day)

	Failure	Toilet self initiated	Toilet other initiated	Total
Baseline period	3.0	4.0	——	7.0
Reinforcement I	3.1	2.9	2.6	8.6
Reinforcement II	3.5	3.8	3.0	10.3
Observation period	5.3	5.4	3.6	14.3
Reinforcement III	1.8	6.4	2.8	11.0
Reinforcement IV	1.0	5.8	2.7	9.5
Generalization	0.2	6.5	2.0	8.7

When you compare the results shown in table 1 above for reinforcement period III with the results shown in table 1 for reinforcement periods I and II it can be readily observed that the frequency of failure decreased from 3.1 in period I and 3.5 in period II to 1.8 per day (on the average) in period III. In addition to this, the frequency of self-initiated toilet usage increased from 2.9 in period I and 3.8 in period II to 6.4 per day (on the average) in period III.

Reinforcement period IV

In addition to the above procedures in period III, in period IV one token was taken away from her for each failure.

In this period the problem of controlling the number of tokens she possessed arose. The tokens were small, plastic flowers of various colors. Although she spent the tokens regularly, she liked to keep them in her small purse and look at them frequently. Since it was possible for her to save all the tokens she felt she wanted and then abandon her developing toilet habits, we believed it was necessary to control the amount of tokens she had. Since she removed her purse before retiring each night, we had the mother remove all tokens in excess of four. Thus she began each day with the remainder of the previous days tokens up to a maximum number of four.

The results of this period were even more striking. The number of failures dropped to 1.0 per day, the number of self-initiated toilet usages increased to 5.8 per day and the number of other-initiated toilet usages was 2.7 per day on the average. In this period the number of failures was much less than in periods I and II and less than in period III.

During this period she has a physical examination including an EEG. She stopped using medication at this time. Later, in the period of generalization, she took medication for 4 days and finally stopped entirely. This medical treatment changed her behavior to some extent but had no influence on her bladder control and toilet behavior.

Period of Generalization

After 140 days of training we stopped reinforcement. For the first 2 days she failed twice but she had no failures after this. At this point we considered her training to be complete.

Summary and Conclusions

The cumulative of her bladder control and toilet behavior (failure, self-initiated and other-initiated) is shown in figure 1. This shows that in the token reinforcement period the number of failures began to decrease and the number of self-initiated usages began to increase. After we added negative reinforcement to the positive reinforcement, this tendency was accelerated. After we stopped the reinforcement, the tendency toward self control of the bladder was maintained. Thus, we can conclude that her toilet training was successful.

This was the first case in which we applied operant principles to a mentally retarded child. There are some deficiencies in the procedures. For example, the baseline period was actually insufficient and observation of the patient was not sufficiently precise. Also, since the observer was the mother, there was a lack of objectivity. However, generally speaking, the results of this study parallel that of M. Wolf. The results of our study were sufficiently gratifying to encourage us to pursue further research in applying operant principles to the mentally retarded.

In parallel to the above study, we applied operant principles to her bowel control problem. We also used the token reinforcement system.

In the base line period she sometimes went to the toilet by herself but usually she soiled herself almost every day. After the 36 days of the baseline period,

she was given 3 tokens for self-initiated bowel control. After 8 days, in addition, 2 tokens were taken from her for a failure. The cumulative record of failures and self-initiated toilet usage is shown in figure 2. This shows that, 1 month after the beginning of the reinforcement, the number of failures decreased significantly and was approaching zero. Later, the number of failures increased temporarily for a short period of time but soon they decreased to almost zero. Even after the token reinforcement stopped, there were almost no failures. It is safe to conclude that her bowel control havits were finally established.

Case 2. Application of operant principles to training in changing clothes

Subject

The subject was a moderately retarded 15 year old girl. She had Down's Syndrome and was also physically handicapped due to Cerebral Palsy contracted when she was 2 years old. The daily tasks of life, such as walking, dressing and undressing consumed an inordinate amount of time which made it very difficult for her to participate in group activity. However, we found that she could react faster than usual when she was engaging in those activities that she most enjoyed. Therefore, we tried to apply operant principles with the objective of decreasing the amount of time she used for changing her clothes.

History

The mother's pregnancy and delivery were normal. However, the child's early development (both physically and mentally) was extremely slow. For instance; her first tooth erupted when she was 1 year and 3 months old, babbling

began at 1 year and 2 months, crawling at 10 months and standing up at 1 year and 6 months. She began walking at the age of 2.

Psychological Examination

The Social Age (SA) was 11 years and 3 months and the Social Quotient (SQ) was 84. The WISC VQ was 40; PQ was 53 and the total IQ was 39. On the Binet scale the MA was 6 years and 3 months and the IQ was 41.

Baseline Period

To establish the baseline we made observations of the following three items. The first was going to school. She was late almost every day. Secondly, there was the problem of changing her clothing. She wore a uniform while going to school where she changed into play clothes. This procedure was repeated in reverse in the afternoon when she was returning home to her dormitory. Each morning changing her clothing took from 30 to 50 minutes.
This occured because shw would stop changing her clothing and wander around before she had completed this task. Thirdly, changing her clothing took less time in the afternoon but it still took from 20 to 40 minutes. Also, she always asked to be helped in changing her clothing.

We set the following objectives:

1. Arrive at school at 8:15 from the dormitory.
2. Change clothing in the morning in at least 20 minutes, decreasing this duration if possible by successive approximations.

3. Change clothing in the evening in at least 25 minutes, decreasing this duration by successive approximations.

In this process we used a timer which she usually set by herself. If she was successful in performing the task within a certain period of time, she received a star. That is, if she arrived at school on time, she received a star from the teacher. Also, if she performed her morning and afternoon clothing changes within a certain duration, as set on the timer, she received a star each time.

Each Saturday she returned home, and, if she had accumulated 12 stars during the week, she could listen to her favorite phonograph record as much as she liked.

The time that she was allowed to change her clothing in was shortened by one minute each week.

Results

The results of 9 weeks of training are shown in figure 3 which shows that the time needed to change clothes in the morning decreased from 20 minutes to 13 minutes. The time needed in the afternoon decreased from 25 to 18 minutes.

After our participation in the experiment ended, the teacher continued to train her using the timer. After 10 months of training, the time that it took for her to change in the morning was less than 10 minutes. The afternoon change took less than 15 minutss. This is almost the same time that it takes for the other students at this school. At this point, the teacher stopped using the timer. According to the post check, the time it took to change clothes was unstable and varied from 4 to 30 minutes. However, on the average, it took 13.9 minutes in

the morning and 12.5 minutes in the afternoon. This is a significant improvement over the time consumed prior to the training.

Case 3. Application of operant principles to Tricycling Behavior

Subject

The subject was a severely retarded 14 year old girl. Her behavior problem was taking tricycles from pre-school children and riding them while going to and from school.

History

Her mother had a normal pregnancy and delivery. She weighed 3000g (6 pounds, 4 ounces) at birth and began to walk wher she was 1 year and 10 months old. She has anamnesis of epilepsy.

Psychological Examination

The results of her psychological tests are as follows :

Social Age (SA) - 4.11

Social Quotient (SQ) - 36

Picture Drawing test - MA - 2.6

Binet test - MA - 3.0

IQ - 28

Baseline and reinforcement period

The frequency of riding tricycles was 1.8 per day on the average. During

this period we investigated the things that she was fond of and found that she liked Coca Cola and Calpis (a milk beverage). Therefore, we used these as reinforcers. When she didn't ride a tricycle she was given Coke or Calpis immediately after returning home.

Results

The results of this training are shown in figure 4 which shows that the frequency of riding tricycles decreased to 0.2 per day on the average, during the reinforcement period. After 4 months of training we stopped the reinforcement. After this, no significant change was found in her behavior.

We attempted to define the second baseline period but it cannot be fruitfully discussed at this time due to a lack of precise records. In field experiences in schools or institutions it is of crucial importance to train teachers or mothers how to properly observe and record the behavior of the subject.

Case 4. Application of operant principles to toilet training

Subject

The subject was a moderately retarded 14 year old boy who had never excreted without an enema since he was 9 months old. At that time he suffered from Meningitis. Also, since that time he has been suffering from Epilepsy and is constantly under medication. For the last three years he has had no convulsions.

Preliminary Observations

He was receiving an enema every 2 days administered by his mother, father or brother. We investigated to see if there was any difference in the subject's

reaction depending on who administered the enema but no difference was discovered.

Psychological Examination

His Binet test scores are MA - 5.10, and IQ - 43.

Process of Training

We applied successive approximation procedures to him. That is to say, he had an enema every two days as before. But, the quantity of glycerin was gradually decreased while the total quantity of the enema remained the same. The date and time of the enema, the quantity of glycerin and water, the duration of the excretion and the condition of the feces were recorded. As a reinforcer we used Black Tea of which he was very fond. Immediately after finishing his bowel movement he was given exceptionally good Black Tea and the verbal reinforcement of saying "good boy".

As is shown in figure 5, after nearly 90 days, the quantity of glycerin was decreased from 5cc per 15 cc of water to 2cc per 18 cc of water. Subsequantly, we kept the amount of glycerin the same while gradually decreasing the quantity of water.

After nearly 120 days from the commencement of the training the total quantity of liquid decreased to 8cc which was composed of 2cc of glycerin and 6cc of water.

We repeated this process of alternately decreasing the amount of glycerin and water.

After 180 days of training he had a bowel movement immediately after having the expty container touched to his buttocks. Finally, normal excretory behavior

was established.

Conclusions

We can consider this case to be the one in which successive approximation procedures worked most effectively although the reinforcing function of the Black Tea is not precisely ascertainable.

Case 5. Application of operant principles in training in walking

Subject

The subject was a profoundly retarded 5 year old girl who could stand and walk to some extent by holding a railing but could never walk by herself.

History

The mother's pregnancy and delivery were normal and the subject weighed 3500 g (7 pounds, 8 ounces) at birth. Her development was quite normal until 2 months after her birth when she had a combined Smallpox, Diptheria and Hooping Cough inoculation. At this time she had a convulsion. When she was 4 or 5 months old she also had a convulsion. Hereafter, the convulsions increased regularly. When she was eight months old she was diagnosed as an Epileptic.

Her first tooth erupted at the age of 10 months and she first stood at the age of 1 year and 3 months. This is not too slow, but, due to the frequency of her convulsions, she spent most of her time in bed until she was 3 years old.

Her convulsions were so severe that the doctor repeatedly told the parents that there was no hope for the subject and that she would die soon.

When she was 4 years old she was allowed to attend a private day care center

for severly retarded children. At that time her condition was as follows. When her name was called, she turned to the caller and smiled. When she was frustrated she cried or got angry. She could recognize those people whom she was fond of. She said "oh, oh" and, "ah, ah". She crawled and could walk for short distances while holding a rail.

Psychological and Medical Examinations

Her Development Quotient (DQ) was 12. Before training she had a physical examination to determine if she was sufficiently strong enough to be able to walk. It was determined that the development of her leg muscles was not good but that they were strong enough to enable her to walk. It was also thought that training in walking would not have an untoward effect on her convulsions.

Procedures

A similar procedure to that of Meyerson, Kerr and Michael was used. That is, two chairs and one organ were arranged as shown in figure 6.

She was put on the floor between the two chairs. One of the trainers who sat on a chair encouraged her to hold onto the back of the chair and stand up by herself. Then, the other trainer urged her to move to the other chair by calling her name. Immediately after she succeeded in moving from one chair to another she was given a reinforcer.

Many kinds of reinforcers were used in the following sequence :

1. Ice Cream
2. Toys
3. Lid of an Ice Cream Container

4. Chocolate

5. Crackers

6. Mirror

7. Lunch

8. Throwing down the lid of an aluminum lunch box

The last was found to be an effective reinforcer.

The distance between the chairs, which began at 86 cm was gradually increased.

Progress of the training

The result of this training (48 sessions in total) is that we could see very slow progress as the distance between the chairs reached 118 cm by the 33rd session. During this period convulsions continued but after 36 sessions the frequency of the convulsions increased rapidly until they occured almost once each day. This made it impossible for us to continue training after 48 sessions.

Discussion

The distance of 118 cm is equivalent to only one or two steps from one chair to the other. We cannot state that this was successful training as in the study of Meyerson, Kerr and Michael. Her failure to walk might be due to her physical condition since perhaps her legs were not sufficiently developed but the more likely reason is that it is due to her severe Epileptic seisures. During the last half of the period of training her medication was changed 12 times and all medicines were found to be ineffective. If her convulsions had stopped, she probably could have succeeded in learning to walk. One year after the training was stopped she had

frequent convulsions and showed a regression in her ability to walk.

The positive finding of this experiment is that we found the throwing down of the lid of the aluminum lunch box was an effective reinforcer for her after trying many other reinforcers that were all ineffective. Even food was ineffective as she soon spit out any food that she was given. At that time, the lid of an aluminum lunch box acciddntly fell on the floor. She laughed at this incident. In this way we fortuitously discovered that this was an effective reinforcer. I have read a report from the United States where it was found that tearing an old shirt was an effective reinforcer for a severly retarded subject. I think that these two incidents show that we must seek and try every sort of thing in attempting to find successful, effective reinforcers.

Case 6. Application of operant principles to the behavior modification of an autistic mentally retarded girl

Subject

The subject was an autistic, retarded 13 year old girl who had behavior patterns such as; holding particular students (mainly men); smelling their heads and inserting her finger into their ears.

History and autistic behavior patterns

Her mother had a normal pregnancy and delivery. She weighed 3500g (7 pounds, 8 ounces) at birth. At the age of 6 months her father died in an accident and she was put into the care of foster parents. She was a very quiet baby but her physical development was quite good until she was able to walk at the age of 14

months. However, she had a poor appetite. When she was taken for a walk in a stroller, she remembered the path immediately and pointed out the way to go the next time.

Before the age of two she was humming popular songs with the exact melody, rythm and tone of the original. From the time she was 7 months old she enjoyed making noises by scratching rough surfaces. She also liked to smell and feel velvet cloth. This behavior continued until she was 10 years old.

When she was 4 years old her mother scolded her in a very rapid voice. She immediately repeated this with the same accent although she could hardly speak except to ask for water and to go to the toilet and this was in baby talk. She also said 'mama'. Furthermore, at this time, she actively disliked having doors partly open.

At the age of 6 she entered a special class for mentally retarded children and became interested in colors. She could give the names of 35 different colors.

At the age of 7 she began to collect beads, tiddly-winks and crayons. She also began to talk to herself and to walk around the room speaking some words that have no meaning. At this time she began to show an interest in origami.

At the age of 8 she began to manifest the behavior of holding boys who had short hair and smelling their heads.

At the age of 10, she was very skillful at rolling paper into long tubes that, in reality, make a very strong twine.

At 11, she talked to herself more often and began to laugh meaninglessly.

Psychological Examination

The results of her psychological tests are as follows:

Social Age (SA) - 4.9

Social Quotient (SQ) - 38

Picture Drawing Test MA - 3.7

Binet Test MA - 4.7

IQ - 34

MoA - 4.8

MoQ - 38

She had a physical examination at the age of 3 years and 6 months by a psychiatrist. She continued under his care on a weekly basis until she was diagnosed as an autistic child when she was 4 years and 2 months old.

Baseline

We observed her behavior patterns, specifically holding men students, smelling their heads and putting her fingers into their ears for 10 days.

Reinforcement Procedure

As a reinforcer we used tiddly-winks of which she was excessively fond and in fact valued as treasures. When she came to school she brought 5 tiddly-winks along with her in a small purse every day. Whenever she showed any of the behavior patterns mentioned above in the baseline period, one of her tiddly-winks was immediately taken away from her. Whenever at least one tiddly-wink was left at the end of the school day, she was given a badge (similar to boy scout merit badges). She could exchange 10 badges for a crayon. The results of this procudure are

shown in figure 7. In this figure, the records for one week are missing due to the teacher's absence.

As we can see in this figure, the problem behavior patterns decreased rapidly until they dropped from 1 per day in the baseline period to 0.3 per day in the reinforcement period.

Discussion

This study is concerned with the autistic behavior patterns of an autistic mentally retarded girl by using her abnormal affection for tiddly-winks (which is an autistic trait) as a reinforcer. From a psycho-therapeutic point of view, it is not advisable to weaken autistic symptoms themselves. A psycho-therapist would say that the patient would have a symptomatic substitution of a symptom is weakened.

As far as this subject is concerned, no symptomatic substitution was found. There were no changes in her behavior due to using the tiddly-winks as a reinforcer.

The weak points of this study are the lack of records for one week because of the teacher's absence, our inability to establish a second base line and the fact that our instructions were not necessarily strictly obeyed. We asked for the cooperation of all members of the school but we did not receive this cooperation.

Current Research

Recently we began to apply operant principles to teach academic skills to retarded children. We made a special machine to teach reading to young retarded children. It has two projectors. From one a picture (for instance 'hand') is projected on the screen in a frame. From the other projector a letter (which means 'hand' in Japanese) is overlapped on the picture. At the start, the letter

is projected and the subject watches it but cannot read it. Then the picture corresponding to the letter appears overlapping the letter. While repeating this procedure, the picture, which is the cue to read the letter, is being faded out and the subject begins to be able to read the letter without the cue. Each time the subject reads the letter correctly, he was reinforced by the lighting and a buzzer. Letters were randomly divided into two groups. One group was taught with this teaching machine and the other with conventional teaching methods.

The subjects were a severely retarded, 14 year old girl, for whom learning to read was considered impossible, and two mildly retarded seven year old boys. Principal findings were that all subjects learned to read the letters better and afterwards showed a higher ratio of retention with the machine than with the conventional procedure.

Summary and a look toward the future

The application of operant principles to retarded children that we have conducted so far have been concerned with self-care, deviant behavior, and, academic skills. Among them the most effective results were gained in training in self-care and the modification of deviant behavior. Although better results in teaching academic skills were also gained, in comparison with conventional teaching, it should be noted that the teaching of reading we conducted is concerned with the formation of automatic skills rather than purely intellectual actions.

When we proceed toward teaching more intellectual actions such as language and number concepts to the mentally retarded, will we have to take into consideration mediation hypothesis ? Or, will operant principles be effective for the

teaching of intellectual actions and concepts as well ? This will be a major problem to be solved by us in the future.

Bibliography

Bijou, S. W. and D. M. Baer. Child Development : A Systematic and Empirical Theory. Vol. 1 New York, Appleton-Century-Crofts. 1961.

Meyerson, L., N. Kerr, and J. L. Michael. Behavior Modification in Rehabilitation. In Bijou, S. W. and D. M. Baer (eds). Child Development : Readings in Experimental Analysis. New York, Appleton-Century-Crofts. 1967, pp. 214 - 239.

Yamaguchi, K. Application of operant Principles to the training of Mentally Retarded Children. Bulletin of the Research Institute for Education of Exceptional Children. Tokyo Gakugei University. No. 3, 198 - 221, 1970. (in Japanese)

Yamaguchi, K. Application of Operant Principles to the training of Mentally Retarded Children. Bulletin of the Research Institute for Education of Exceptional Children. Tokyo Gakugei University. No. 4, 169 - 184, 1971. (in Japanese)

BEST COPY AVAILABLE

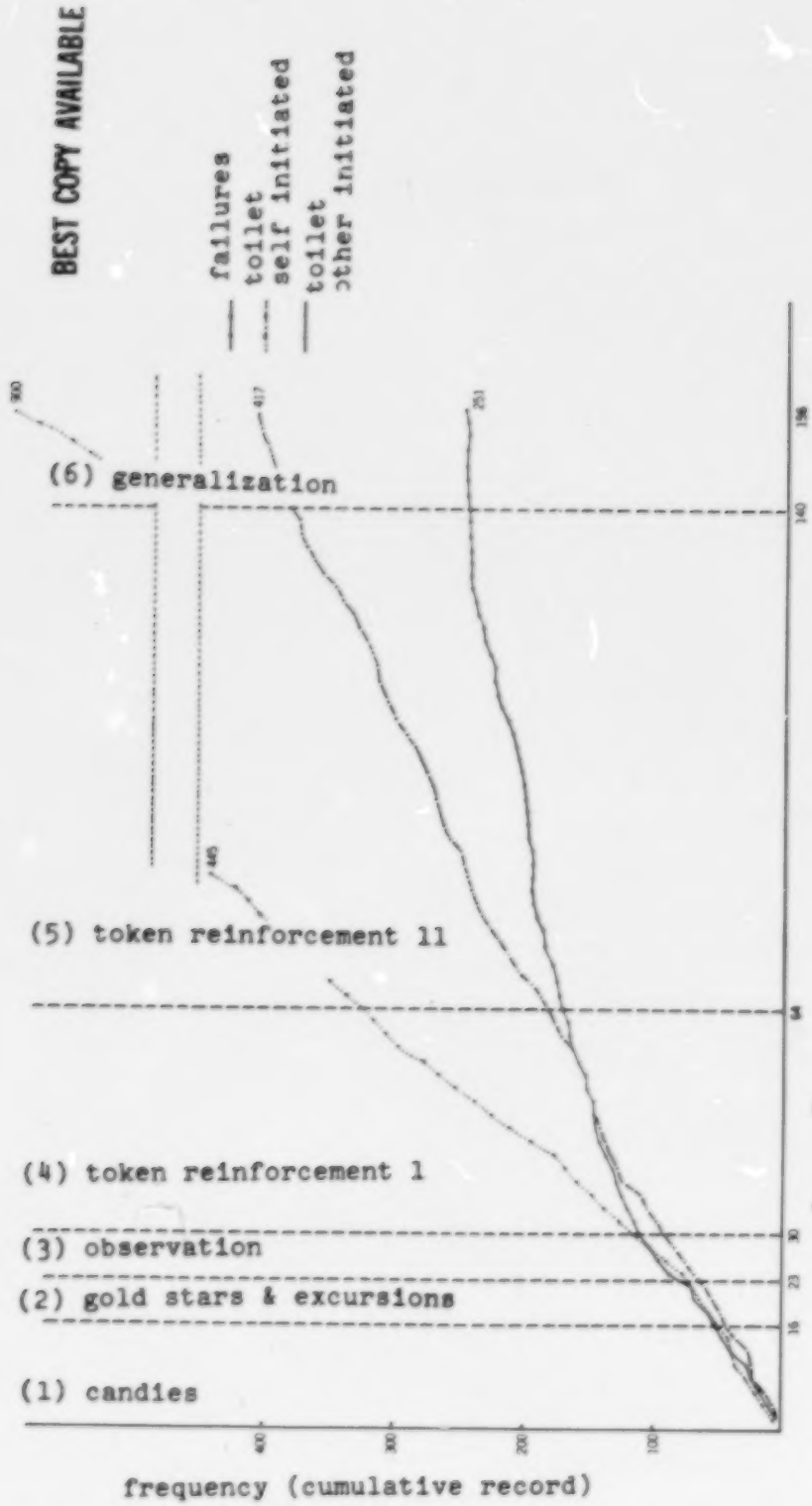

Fig. 1 toilet training (enuresis diurna)

BEST COPY AVAILABLE

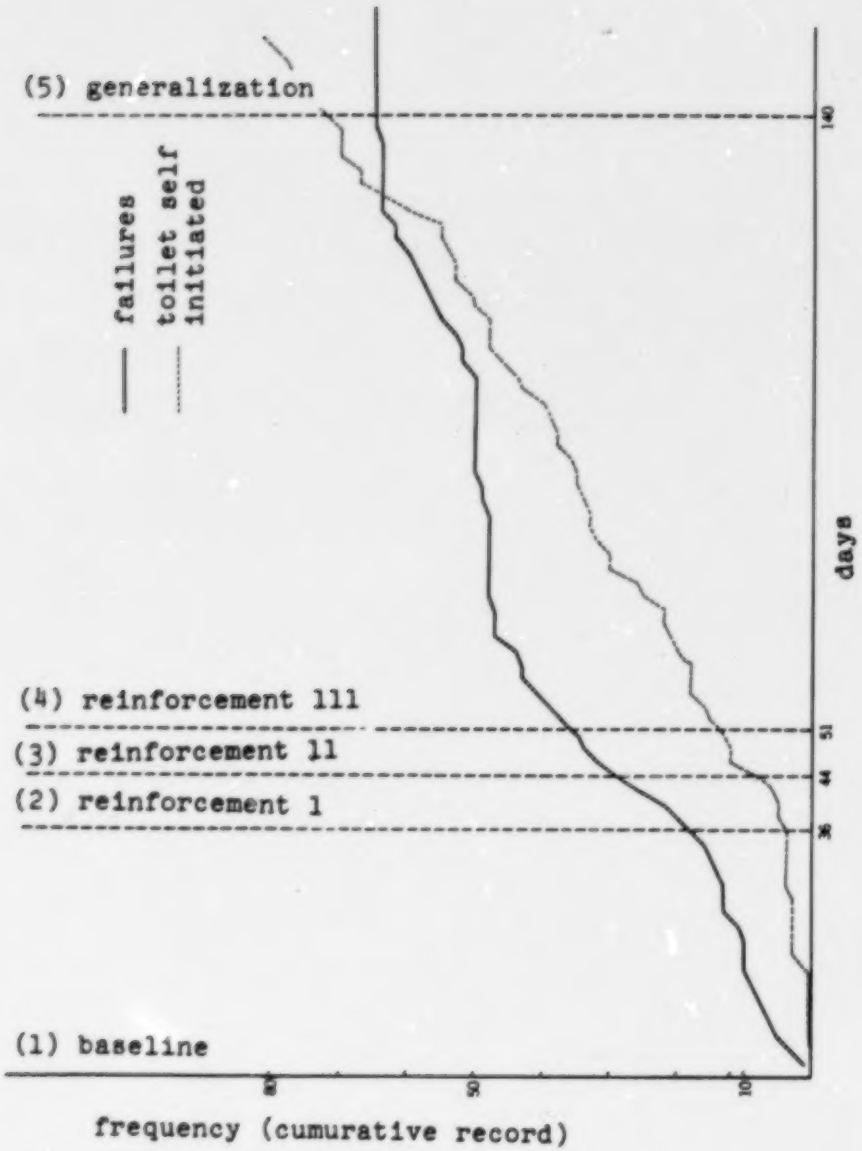

Fig. 2 toilet training (faeces)

BEST COPY AVAILABLE

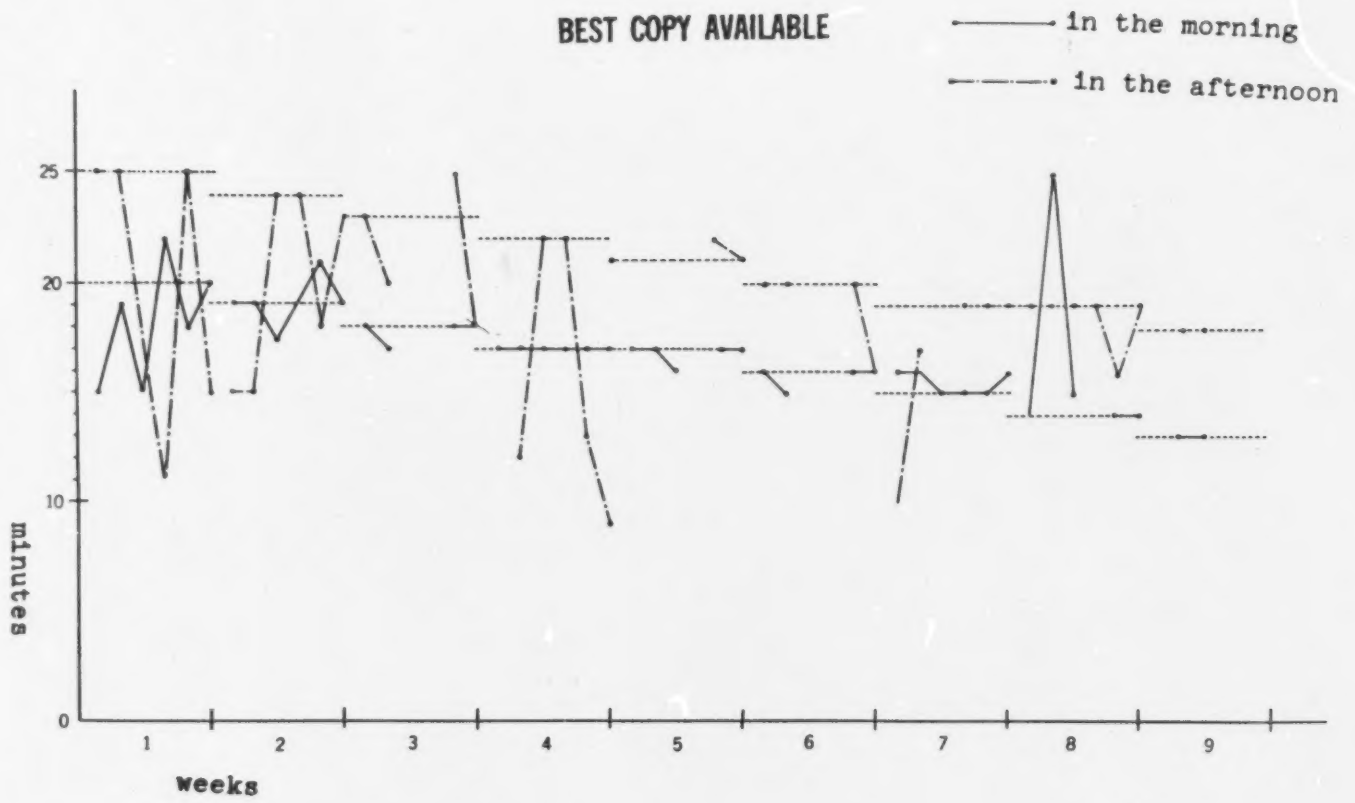

Fig. 3 dressing and undressing

BEST COPY AVAILABLE

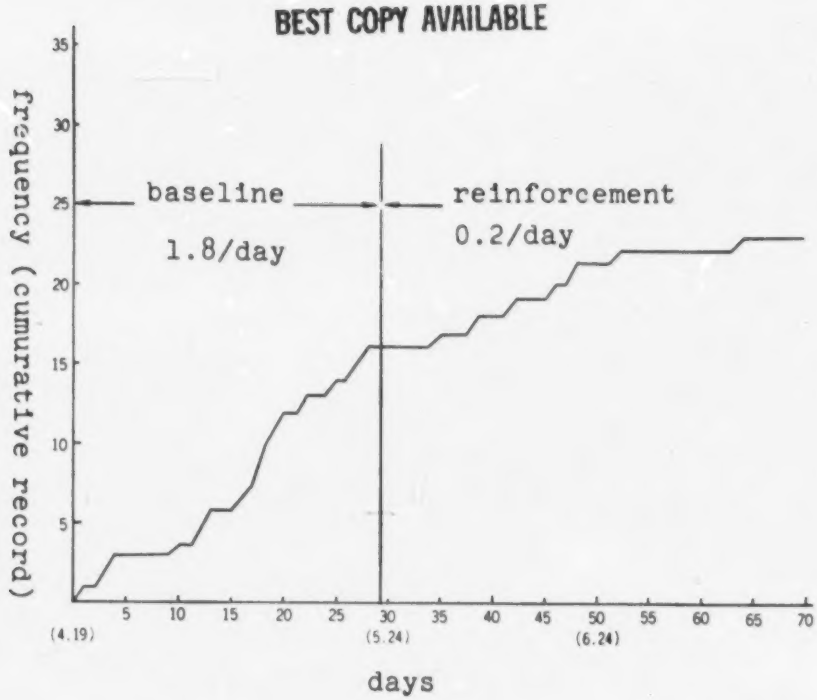

Fig. 4 riding a tricycle

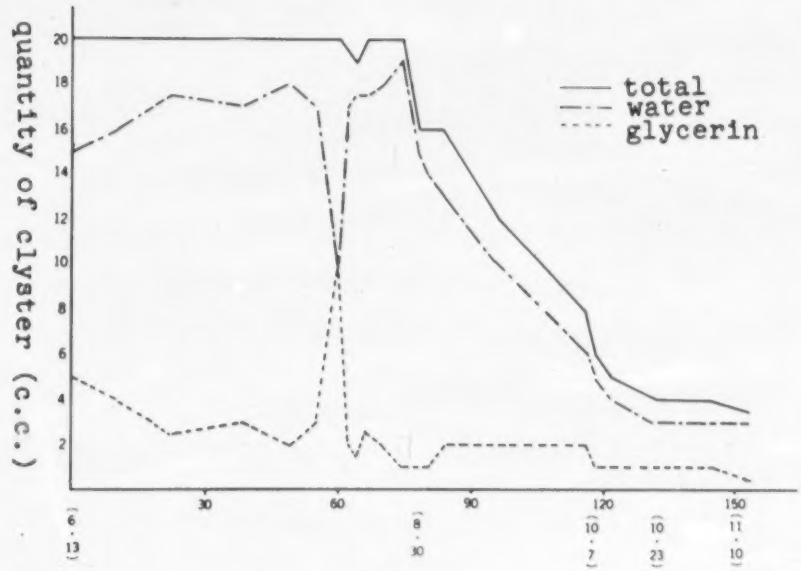

Fig. 5 toilet training

BEST COPY AVAILABLE

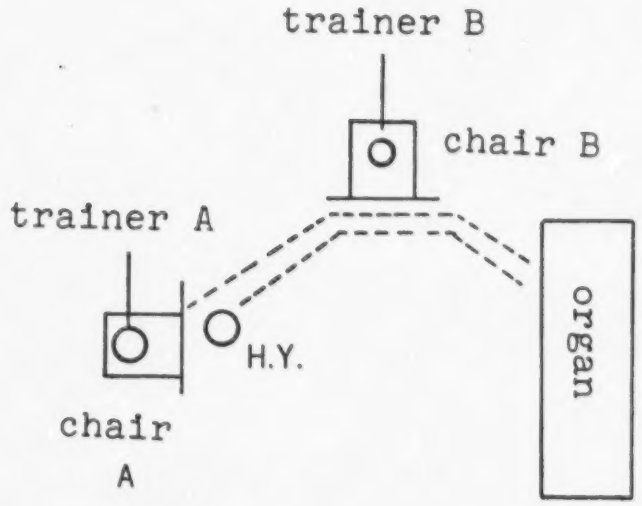

Fig. 6 training in walking

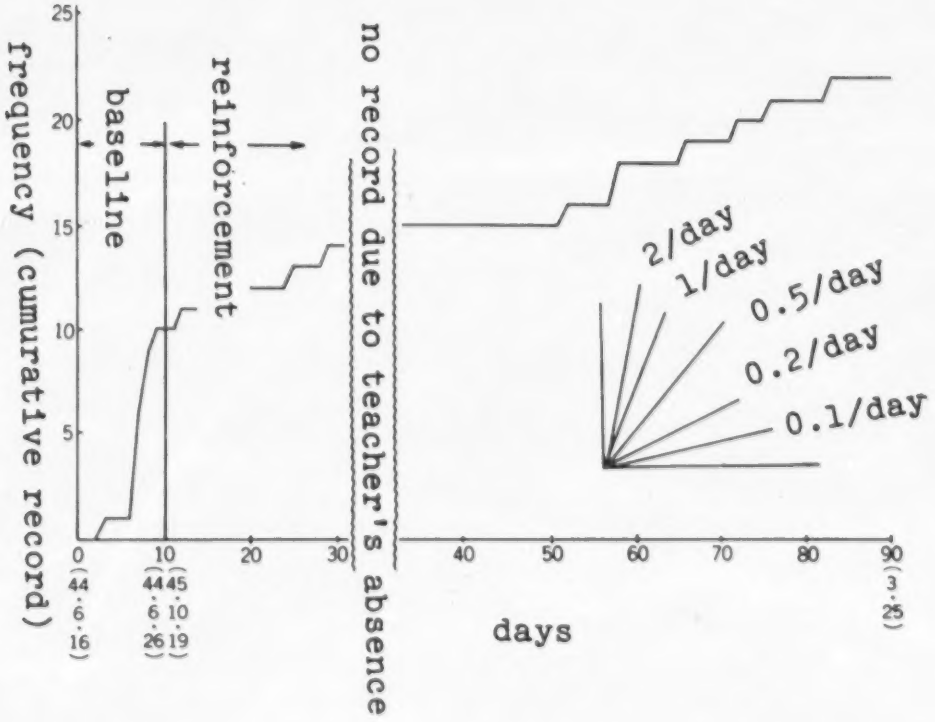

Fig. 7 autistic behavior